STIC Search Report
EIC 2800

STIC Database Tracking Number: 137303

TO: Dung T Nguyen Location: JEF 5C15 Art Unit : 2828 Friday, November 12, 2004 Case Serial Number: 10/025866	From: Irina Speckhard Location: EIC 2800 JEF 4B59 Phone: (571) 272-2554 irina.speckhard@uspto.gov

Search Notes

Examiner Nguyen,

Please find attached prior-art search results from the patent and non-patent abstract and full-text databases. The results were based on claims and statements of technical problems and solutions. Tagged records might be worth your review as well as the rest of the references provided.

If you need further searching or have questions or comments, please let me know.

Thank you,

Irina Speckhard

EIC2800
Fast & Focused Search Feedback Form

The search results generated for your ***Fast & Focused*** search request are attached.
If you have any questions or comments about the scope or the results of the search, please contact ***the EIC searcher*** who conducted the search ***or contact***:

Jeff.Harrison@uspto.gov , EIC2800 Team Leader, 272-2511

Voluntary Results Feedback Form

➢ *I am an examiner in Workgroup:* ☐ *Example: 2810*

➢ *Were you satisfied with the coverage and search strategies of this search?* ☐ YES ☐ NO

Why/Why Not?

➢ *Relevant prior art **found**, search results used as follows:*

☐ 102 rejection

☐ 103 rejection

☐ Cited as being of interest.

☐ Helped examiner better understand the invention.

☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

☐ Foreign Patent(s)

☐ Non-Patent Literature (journal articles, conference proceedings, etc.)

➢ *Relevant prior art **not found:***

☐ Results verified the lack of relevant prior art (helped determine patentability).

☐ Search results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to **STIC-EIC2800, JEF-4B68. Thanks.**

137303

SEARCH REQUEST FORM **Scientific and Technical Information Center - EIC2800**

Rev. 3/15/2004 This is an experimental format -- Please give suggestions or comments to Jeff Harrison, JEF-4B68, 272-2511.

Date 11/03/04 Serial # 10/025866 Priority Application Date 11/29/01

Your Name NGUYEN DUNG T Examiner # 79581

AU 2828 Phone 2 1949 Room FLOOR 5 - C15

In what format would you like your results? Paper is the default. (PAPER) DISK EMAIL

If submitting more than one search, please prioritize in order of need.

The EIC searcher normally will contact you before beginning a prior art search. If you would like to sit with a searcher for an interactive search, please notify one of the searchers.

11-03-04 A10:57 IN

Where have you searched so far on this case?
Circle: USPT DWPI EPO Abs JPO Abs IBM TDB

Other: _____

What relevant art have you found so far? Please attach pertinent citations or Information Disclosure Statements. _____

What types of references would you like? Please checkmark:

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Secondary Refs ___ Foreign Patents ___
Teaching Refs ___

What is the topic, such as the **novelty**, motivation, utility, or other specific facets defining the desired **focus** of this search? Please include the concepts, synonyms, keywords, acronyms, registry numbers, definitions, structures, strategies, and anything else that helps to describe the topic. Please attach a copy of the abstract and pertinent claims.

Staff Use Only	Type of Search	Vendors
Searcher: Speck Lee	Structure (#)	STN
Searcher Phone:	Bibliographic ✓	Dialog ✓
Searcher Location: STIC-EIC2800, JEF-4B68	Litigation	Questel/Orbit ✓
Date Searcher Picked Up: 11/12/04	Fulltext ✓	Lexis-Nexis
Date Completed: 11/12/04	Patent Family ✓	WWW/Internet
Searcher Prep/Rev Time: 60	Other: citat.	Other
Online Time: 60		

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SYSTEM:OS  - DIALOG OneSearch
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Enter HELP NEWS 331 for details.
  File 347:JAPIO Nov 1976-2004/Jul(Updated 041102)
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*File 347: JAPIO data problems with year 2000 records are now fixed.
Alerts have been run.  See HELP NEWS 347 for details.
  File 344:Chinese Patents Abs Aug 1985-2004/May
         (c) 2004 European Patent Office
  File 371:French Patents 1961-2002/BOPI 200209
         (c) 2002 INPI.  All rts. reserv.
*File 371: This file is not currently updating. The last update is 200209.
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Set	Items	Description
S1	2551	GAIN(2W)COUPL?
S2	24950	COUPL?(3N)COEFFICIENT? ? OR KL()IM OR IM(3N)(COUPL? OR GAIN? OR COEFFICIENT? ?)
S3	25627	(DECIBEL OR DB)(3N)(COUPL? OR GAIN)
S4	242	S1 AND S2
S5	8	S4 AND S3
S6	3	RD (unique items)
S7	30596	(DECIBEL OR DB)(3N)(COUPL? OR GAIN OR REDUC?)
S8	171780	GRATE???? OR GRATING
S9	42640	RECEIV?(3N)POWER?
S10	4667	POWER?(3N)PENALT?
S11	8	S4 AND S7
S12	105	S4 AND S8
S13	0	S12 AND S9
S14	0	S12 AND S10
S15	105	S12 AND LASER?
S16	82	S15 AND DFB(3N)LASER?
S17	749	S2 AND DFB(3N)LASER?
S18	384	S17 AND S8
S19	82	S18 AND S1
S20	0	S19 AND S10
S21	0	S19 AND S9
S22	47	RD S19 (unique items)

6/3,AB/1 (Item 1 from file: 2)
DIALOG(R)File 2:INSPEC

7852041 INSPEC Abstract Number: A2004-05-4265C-004, B2004-03-4320F-021
Title: Small-core As-Se fiber for Raman amplification
Author(s): Thielen, P.A.; Shaw, L.B.; Pureza, P.C.; Nguyen, V.Q.; Sanghera, J.S.; Aggarwal, I.D.
Author Affiliation: SFA Inc., Largo, MD, USA
Journal: Optics Letters vol.28, no.16 p.1406-8
Publisher: Opt. Soc. America,
Publication Date: 15 Aug. 2003 Country of Publication: USA
CODEN: OPLEDP ISSN: 0146-9592
SICI: 0146-9592(20030815)28:16L.1406:SCFR;1-Y
Material Identity Number: O053-2003-017
Language: English
Abstract: We have demonstrated Raman amplification in small-core As-Se fiber. More than 20-**dB** of **gain** was observed in a 1.1-m length of fiber pumped by a nanosecond pulse of ~10.8-W peak power at 1.50 mu m. The peak of the Raman gain occurred at a shift of ~240 cm/sup -1/. The Raman gain coefficient is estimated to be ~2.3*10/sup -11/ m/W, which is more than 300 times greater than that of silica. The large Raman **gain coefficient coupled** with the large IR transparency window of these fibers shows promise for development of As-Se Raman fiber lasers and amplifiers in the near-, mid-, and long-IR spectral regions.
Subfile: A B

6/3,AB/2 (Item 2 from file: 2)
DIALOG(R)File 2:INSPEC

7316281 INSPEC Abstract Number: A2002-16-4265C-006, B2002-08-4320F-008
Title: Raman amplification in As-Se fiber
Author(s): Thielen, P.A.; Shaw, L.B.; Pureza, P.C.; Nguyen, V.Q.; Sanghera, J.S.; Aggarwal, I.D.
Author Affiliation: SFA Inc., Largo, MD, USA
Journal: Proceedings of the SPIE - The International Society for Optical Engineering Conference Title: Proc. SPIE - Int. Soc. Opt. Eng. (USA) vol.4628 p.74-7
Publisher: SPIE-Int. Soc. Opt. Eng,
Publication Date: 2002 Country of Publication: USA
CODEN: PSISDG ISSN: 0277-786X
SICI: 0277-786X(2002)4628L.74:RAF;1-X
Material Identity Number: C574-2002-181
U.S. Copyright Clearance Center Code: 0277-786X/02/$15.00
Conference Title: Nonlinear Materials: Growth, Characterization, Devices, and Applications
Conference Sponsor: SPIE
Conference Date: 21 Jan. 2002 Conference Location: San Jose, CA, USA
Language: English
Abstract: We have demonstrated Raman amplification in small core As-Se fiber. We observed over 20 **dB** of **gain** in a 1.1-meter length of fiber pumped by a nanosecond pulse of approximately 10.8 W peak power at 1.50 mu m. The peak of the Raman gain was shifted by approximately 230 cm/sup -1/ to 1.56 mu m. The Raman gain coefficient is estimated to be about 2.3*10/sup -11/ m/W, over 300 times greater than that of silica. The large Raman **gain coefficient coupled** with the large IR transparency window of these fibers shows promise for development of As-Se

Raman fiber lasers and amplifiers in the near, mid and long IR spectral regions.
Subfile: A B

6/3,AB/3 (Item 1 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

05479681
E.I. No: EIP00025041025
Title: Strongly **gain-coupled** (SGC) coolerless (minus 40 degree C approx. plus 85 degree C) MQW DFB lasers
Author: Hong, J.; Blaauw, C.; Moore, R.; Jatar, S.; Dzioba, S.
Corporate Source: Nortel, Ottawa, Ont, Can
Source: IEEE Journal on Selected Topics in Quantum Electronics v 5 n 3 May-Jun 1999. p 442-448
Publication Year: 1999
CODEN: IJSQEN ISSN: 1077-260X
Language: English
Abstract: Single-mode operation in a wide temperature range (minus 40 degree C approx. plus 85 degree C) has been obtained, from an etched-QW strongly **gain-coupled** (SGC) distributed-feedback laser at 1.3 mu m. The SGC lasers exhibit an excellent sidemode-suppression-ratio (SMSR) of around 45-55 dB in continuous-wave operation, and a very good transient SMSR (TSMSR) of more than 35 **dB** during a **gain** -switched operation, both are over the entire temperature range. When mounted P-side up, the threshold current is about 12 mA at room temperature and 28 mA at plus 85 degree C. The output power is more than 20 mW with only 120-mA injection current at plus 85 degree C. (Author abstract) 8 Refs.

22/3,AB/1 (Item 1 from file: 2)
DIALOG(R)File 2:INSPEC

7881397 INSPEC Abstract Number: A2004-07-4255P-016, B2004-04-4320J-025
Title: Enhanced wavelength shift in partly **gain-coupled** distributed feedback lasers using quantum well intermixing
Author(s): Zhan, L.; Chan, K.S.; Pun, E.Y.B.; Ho, H.P.
Author Affiliation: Dept. of Electron. Eng., Hong Kong Univ., China
Journal: Optics Communications vol.228, no.1-3 p.167-75
Publisher: Elsevier,
Publication Date: 1 Dec. 2003 Country of Publication: Netherlands
CODEN: OPCOB8 ISSN: 0030-4018
SICI: 0030-4018(20031201)228:1/3L.167:EWSP;1-4
Material Identity Number: O015-2003-023
U.S. Copyright Clearance Center Code: 0030-4018/03/$30.00
Language: English
Abstract: In this paper, we present a theoretical study on the properties of wavelength shift due to quantum well (QW) intermixing in the partly **gain-coupled** distributed feedback lasers. A maximum possible wavelength red-shift of 9.2 nm is predicted if using a proper DFB **grating**, whose period is smaller than that in the conventional **DFB lasers**. In contrast to the index-coupled lambda /4-shifted **DFB lasers** , no increase in carrier density is required to compensate for the gain reduction due to QW intermixing, as the threshold gain in the partly **gain-coupled DFB laser** decreases with QW intermixing because of the increase in the **coupling coefficient** . The infected threshold current density for lasing is considerably flat in the wavelength red-shift range. The result is important as it indicates that the QW intermixing technique may be used in the fabrication of the equal threshold **DFB lasers** with different wavelengths in the monolithically integrated laser arrays.
Subfile: A B

22/3,AB/2 (Item 2 from file: 2)
DIALOG(R)File 2:INSPEC

7800981 INSPEC Abstract Number: A2004-02-4255P-011, B2004-01-4320J-052
Title: Characteristics of GaAs/AlGaAs quantum-wire distributed-feedback lasers with different gain modifications
Author(s): Tae Geun Kim
Author Affiliation: Dept. of Semicond. & New Mater. Eng., Kwangwoon Univ., Seoul, South Korea
Journal: Journal of the Korean Physical Society vol.42, no.6 p. 791-4
Publisher: Korean Phys. Soc,
Publication Date: June 2003 Country of Publication: South Korea
CODEN: KPSJAS ISSN: 0374-4884
SICI: 0374-4884(200306)42:6L.791:CGAQ;1-J
Material Identity Number: J068-2003-011
Language: English
Abstract: GaAs/AlGaAs quantum-wire (QWR) **gain-coupled** distributed-feedback (GC-**DFB**) **lasers** were fabricated and characterized. Interestingly, as the shape of the active **grating** was varied, the lasing characteristics changed greatly; for example, one laser with sharp gratings lased at a threshold current of 13 mA while another one with dull gratings lased at 230 mA. This may be due to a change in the

gain coupling coefficient with the shape of the QWR active **grating**. Little observation of the stopband and the wavelength consistency between the lasing and the photoluminescence peaks of the QWRs also provided evidence for lasing via GC-DFB effects in these devices.
Subfile: A B

22/3,AB/3 (Item 3 from file: 2)
DIALOG(R)File 2:INSPEC

7600592 INSPEC Abstract Number: A2003-11-4255M-005, B2003-06-4320E-003
Title: Numerical simulation of a pulsed laser pumped distributed-feedback waveguided dye laser by coupled-wave theory
Author(s): Zuo, D.; Oki, Y.; Maeda, M.
Author Affiliation: Graduate Sch. of Inf. Sci. & Electr. Eng., Kyushu Univ., Fukuoka, Japan
Journal: IEEE Journal of Quantum Electronics vol.39, no.5 p.673-80
Publisher: IEEE,
Publication Date: May 2003 Country of Publication: USA
CODEN: IEJQA7 ISSN: 0018-9197
SICI: 0018-9197(200305)39:5L.673:NSPL;1-X
Material Identity Number: I105-2003-004
U.S. Copyright Clearance Center Code: 0018-9197/03/$17.00
Language: English
Abstract: A dynamic model of pulsed **laser** pumped distributed-feedback (**DFB**) waveguided dye **laser** based on a coupled-wave theory is described. Due to the periodical distribution of the intensities of pump source and stimulated emission along the waveguide, the rate equations of the population densities are turned into the equations of the Fourier **coefficients**. **Coupled** -wave equations of optical fields are used to simulate the laser oscillation. Besides the temporal evolution of the output intensity, the spectra can also be obtained by the Fourier transform of the optical fields. Two different configurations of the waveguided dye **laser**, prefabricated **DFB** (mainly index coupling), first- and second-order holographic DFB (dynamic **gain-coupling**), are considered in the model. The simulation shows that: 1) the temporal waveforms of the holographic DFB consist of sharp spikes; 2) the broadened spectral widths resulted from the possible nonuniformities in propagation constant or **grating** period are less than 50 pm except for the second-order holographic DFB; and 3) strong parasitic oscillations can be observed in the second-order holographic DFB with terminal reflection. These results and the comparisons of some of them to the experiments are reported.
Subfile: A B

22/3,AB/4 (Item 4 from file: 2)
DIALOG(R)File 2:INSPEC

6564978 INSPEC Abstract Number: A2000-10-4260B-024, B2000-05-4320J-126, C2000-05-7320-072
Title: LAPAREX-an automatic parameter extraction program for **gain-** and index-**coupled** distributed feedback semiconductor lasers, and its application to observation of changing **coupling: coefficients** with currents
Author(s): Nakura, T.; Nakano, Y.

Author Affiliation: Dept. of Electron. Eng., Tokyo Univ., Japan
Journal: IEICE Transactions on Electronics vol.E83-C, no.3 p.488-95
Publisher: Inst. Electron. Inf. & Commun. Eng,
Publication Date: March 2000 Country of Publication: Japan
CODEN: IELEEJ ISSN: 0916-8524
SICI: 0916-8524(200003)E83C:3L.488:LAPE;1-K
Material Identity Number: P712-2000-004
Language: English
Abstract: A reliable and automatic parameter extraction technique for **DFB lasers** is developed. The parameter extraction program which is named "LAPAREX" is able to determine many device parameters from a measured sub-threshold spectrum only, including **gain**- and index-**coupling coefficients**, and spatial phases of the **grating** at front and rear facets. Injection current dependence of **coupling coefficients** in a **gain-coupled DFB-laser** is observed, for the first time, by making use of it.
Subfile: A B C

22/3,AB/5 (Item 5 from file: 2)
DIALOG(R)File 2:INSPEC

6385378 INSPEC Abstract Number: A1999-23-4260B-005, B1999-12-4320J-016
Title: Optimization of **grating** structures in complex-coupled MQW **DFB lasers** with absorptive gratings
Author(s): Sung-Chan Cho; Dong-Chan Rhee; Boo-Gyoun Kim
Author Affiliation: Dept. of Electron. Eng., Soongsil Univ., South Korea
Journal: Journal of the Institute of Electronics Engineers of Korea D vol.36-D, no.7 p.80-91
Publisher: Inst. Electron. Eng. Korea,
Publication Date: July 1999 Country of Publication: South Korea
CODEN: CKODF8 ISSN: 1226-5845
SICI: 1226-5845(199907)36D:7L.80:OGSC;1-J
Material Identity Number: G412-1999-011
Language: Korean
Abstract: We present various optimal **grating** structures which give low threshold gain, good modulation characteristics, small effective linewidth enhancement factor, and large fabrication tolerance in complex-coupled MQW **DFB lasers** with absorptive gratings. To obtain these, we calculate the complex **coupling coefficients** using the extended additional layer method and the threshold gain including the modal loss in the absorptive **grating** region for rectangular and trapezoidal gratings. Based on the comparison of the results for various possible absorptive **grating** structures, the design guidelines are presented to obtain the low threshold gain or large fabrication tolerance. Among the **grating** structures studied, the double **grating** structure consisting of the absorptive **grating** on the index **grating** has the largest fabrication tolerance for the threshold **gain** and the **coupling** strength. The fabrication tolerance for the coupling ratio is very large for all the **grating** structures studied.
Subfile: A B

22/3,AB/6 (Item 6 from file: 2)
DIALOG(R)File 2:INSPEC

6380052 INSPEC Abstract Number: A1999-22-4255P-071, B1999-11-4320J-148
Title: High-power single longitudinal mode operation of distributed feedback laser diodes with a decoupled confinement heterostructure
Author(s): Okada, S.; Fujimoto, T.; Yamada, Y.; Yamada, Y.; Okubo, A.; Muro, K.
Author Affiliation: Electron. & Inf. Mater. Lab., Mitsui Chem. Inc., Chiba, Japan
Journal: Review of Laser Engineering vol.27, no.7 p.484-9
Publisher: Laser Soc. Japan,
Publication Date: July 1999 Country of Publication: Japan
CODEN: REKEDA ISSN: 0387-0200
SICI: 0387-0200(199907)27:7L.484:HPSL;1-1
Material Identity Number: M701-1999-008
Language: Japanese
Abstract: A new design of a real-index-guided distributed feedback **laser** diode (**DFB** -LD) based on a decoupled confinement heterostructure (DCH) has been proposed and the characteristics of high power single longitudinal and lateral mode operation have been investigated. A **grating** was located at the interface under the current blocking layer embedded in the GaAs waveguide, so that the current injection path was kept free from contamination during the fabrication processes. A single longitudinal and lateral mode operation up to 400 mW has been achieved at 25 degrees C, CW condition. The oscillation wavelength was around 978 nm and its temperature dependence was 0.087 nm/K. With increasing output power, the oscillating longitudinal mode shifts moderately (0.0023 nm/mW) to longer wavelength undergoing a few mode hops. The specific features of DCH such as low thermal and electrical resistance and a low **gain coupling coefficient** may contribute to suppression of the thermal disturbance and the hole-burning effect, and thus lead to an extremely high power single mode operation.
Subfile: A B

22/3,AB/7 (Item 7 from file: 2)
DIALOG(R)File 2:INSPEC

6285978 INSPEC Abstract Number: A1999-15-4255P-071, B1999-08-4320J-078
Title: 1.5 mu m InGaAsP/InP strained MQW **gain-coupled** **DFB** **laser** with an improved periodically modulated injection-carrier **grating**
Author(s): Yi Luo; Guo-Peng Wen; Yu-Nong Gan; Ke-Qian Zhang; Sudoh, T.K.; Sudo, S.; Nakano, Y.; Tada, K.
Author Affiliation: Dept. of Electron. Eng., Tsinghua Univ., Beijing, China
Journal: Journal of the Korean Physical Society Conference Title: J. Korean Phys. Soc. (South Korea) vol.34, suppl.issue p.S101-3
Publisher: Korean Phys. Soc,
Publication Date: April 1999 Country of Publication: South Korea
CODEN: KPSJAS ISSN: 0374-4884
SICI: 0374-4884(199904)34+L.s101:ISGC;1-P
Material Identity Number: J068-1999-006
Conference Title: Proceedings of 1998 Asian Science Seminar, International Workshop on Physics and Applications of Semiconductor Quantum Structures
Conference Date: 18-23 Oct. 1998 Conference Location: Cheju, South Korea
Language: English

Abstract: A 1.55 mu m InGaAsP/InP strained multiple quantum well (MQW) distributed feedback (**DFB**) **laser** with an improved periodically modulated injection-carrier **grating** is reported for the first time. In this laser structure, the effect of the current blocking **grating** is enhanced by optimizing the doping level of its surrounding layers, therefore a large **gain coupling coefficient** can be expected. The device is fabricated by hybrid growth of MOVPE and LPE. A single-mode oscillation yield as high as 80% is achieved under the condition of two cleaved facets.

Subfile: A B

22/3,AB/8 (Item 8 from file: 2)
DIALOG(R)File 2:INSPEC

5988327 INSPEC Abstract Number: A9818-4255P-008, B9809-4320J-077

Title: Feasibility study on the application of the quantum disk to the **gain-coupled** distributed feedback laser

Author(s): Susa, N.

Author Affiliation: NTT Opto-Electron. Labs., Kanagawa, Japan

Journal: IEEE Journal of Quantum Electronics vol.34, no.8 p.1317-24

Publisher: IEEE,

Publication Date: Aug. 1998 Country of Publication: USA

CODEN: IEJQA7 ISSN: 0018-9197

SICI: 0018-9197(199808)34:8L.1317:FSAQ;1-L

Material Identity Number: I105-98008

U.S. Copyright Clearance Center Code: 0018-9197/98/$10.00

Language: English

Abstract: This numerical study investigated the possibility of using quantum disks in a **gain-coupled** distributed feedback (**DFB**) **laser** , specifically whether the laser would oscillate when the number of electrons in a disk (N/sub th/) is less than the maximum possible number of electrons in the disk (i.e., oscillate at a threshold material gain (g/sub th/) less than the maximum peak material gain for each quantum disk). The influences of the disk diameter and thickness, the number of disks stacked vertically in a layer (N/sub st/), the device length, the period perpendicular to the light propagation direction, and facet reflectivity on the g/sub th/, the threshold current density (J/sub th/), and the normalized **gain-coupling coefficient** (K/sub g/L) were also examined. When N/sub st/ is increased, g/sub th/ decreases to less than the value estimated when assuming that the product of g/sub th/ and N/sub st/ is constant. Although closely spaced disks are useful for reducing g/sub th/, there is an optimum disk distribution minimizing J/sub th/, and this distribution depends on the parameters described above. The J/sub th/ also depends on the disk size and is smallest when the diameter is 6 nm. The magnitude of K/sub g/L is about 0.76 and is independent of the height of the gain **grating** (i.e., N/sub st/), but it can be controlled by adjusting the disk diameter and the facet reflectivity.

Subfile: A B

22/3,AB/9 (Item 9 from file: 2)
DIALOG(R)File 2:INSPEC

5936634 INSPEC Abstract Number: A9814-4255P-020, B9807-4320J-064

Title: A coupled mode analysis of complex coupled **DFB lasers**

Author(s): Zakery, A.; Zare, R.; Bakhtazad, A.
Author Affiliation: Dept. of Phys., Shiraz Univ., Iran
Journal: International Journal of Optoelectronics vol.11, no.5 p. 345-51
Publisher: Taylor & Francis,
Publication Date: Sept.-Oct. 1997 Country of Publication: UK
CODEN: IJOOEV ISSN: 0952-5432
SICI: 0952-5432(199709/10)11:5L.345:CMAC;1-6
Material Identity Number: M510-98002
U.S. Copyright Clearance Center Code: 0952-5432/97/$12.00
Language: English
Abstract: The superiority of **gain-** or loss-**coupled** distributed feedback (**DFB**) **lasers** over index coupled ones is evident in many respects. However, the fabrication of first-order **gain-** or loss-**coupled** gratings involves many difficulties. In fact, we are practically restricted to employing higher-order **gain-** or loss-**coupled** gratings, which are mixed with index-coupling. One of the main disadvantages of higher-order gratings is radiation loss. To take into account both the effects of higher-order modes on coupling and losses in a linear regime, we apply a well-known coupled wave analysis due to Streifer et al. To complex coupled **DFB lasers**. It leads to a pair of **coupled** wave equations, where **coefficients** indicate all the possible coupling and losses. The **coupling coefficient** kappa and other **coupling coefficients** zeta /sub i/, i=1, 2, 3, 4 are obtained for a second-order rectangular loss **grating** where, in fact, the gain and index are in an antiphase position. Threshold conditions, and longitudinal modal patterns are obtained and discussed.
Subfile: A B

22/3,AB/10 (Item 10 from file: 2)
DIALOG(R)File 2:INSPEC

5745796 INSPEC Abstract Number: A9724-4260B-026, B9712-4320J-186
Title: Characterization of excess noise induced by external reflection in 1.55 mu m **gain-coupled DFB lasers** of absorptive **grating** type
Author(s): Nakano, Y.; Funabashi, M.; Yatsu, R.; Nakura, T.; Tada, K.
Author Affiliation: Dept. of Electron. Eng., Tokyo Univ., Japan
Conference Title: 11th International Conference on Integrated Optics and Optical Fibre Communications 23rd European Conference on Optical Communications IOOC-ECOC 97 (Conf. Publ. No.448) Part vol.1 p.25-8 vol.1
Publisher: IEE, London, UK
Publication Date: 1997 Country of Publication: UK 5 vol. (xiii+202+xvi+296+xviii+370+viii+120+vii+92) pp.
ISBN: 0 85296 697 0 Material Identity Number: XX97-02523
Conference Title: 11th International Conference on Integrated Optics and Optical Fibre Communications 23 European Conference on Optical Communications IOOC-ECOC97 (Conf. Publ. No.448)
Conference Sponsor: IEE
Conference Date: 22-25 Sept. 1997 Conference Location: Edinburgh, UK
Language: English
Abstract: We have fabricated 1.55 mu m InGaAsP-InP strained multiple-quantum-well **gain-coupled DFB lasers** of absorptive **grating** type, and characterized their excess noise induced by external reflection from several meters. **Coupling coefficient** dependence of the critical feedback level is discussed.

Subfile: A B
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22/3,AB/11 (Item 11 from file: 2)
DIALOG(R)File 2:INSPEC

5678715 INSPEC Abstract Number: A9719-4260B-029, B9710-4320J-121
Title: Comparision of InGaAs absorptive **grating** structures in 1.55 mu m InGaAsP/InP strained MQW **gain-coupled DFB lasers**
Author(s): Funabashi, M.; Kawanishi, H.; Sudoh, T.K.; Nakura, T.; Schmitz, D.; Schulte, F.; Nakano, Y.; Tada, K.
Author Affiliation: Dept. of Electron. Eng., Tokyo Univ., Japan
Conference Title: Conference Proceedings. 1997 International Conference on Indium Phosphide and Related Materials (Cat. No.97CH36058) p.292-5
Publisher: IEEE, New York, NY, USA
Publication Date: 1997 Country of Publication: USA xii+680 pp.
ISBN: 0 7803 3898 7 Material Identity Number: XX97-01229
U.S. Copyright Clearance Center Code: 0 7803 3898 7/97/$10.00
Conference Title: Conference Proceedings. 1997 International Conference on Indium Phosphide and Related Materials
Conference Sponsor: IEEE Lasers & Electro-Opt. Soc.; IEEE Electron Devices Soc
Conference Date: 11-15 May 1997 Conference Location: Cape Cod, MA, USA
Language: English
Abstract: In **gain-coupled** (GC) distributed-feedback (**DFB**) **lasers** of absorptive **grating** type, the device characteristics depend very much on the absorptive **grating** configuration such as duty cycle, layer thickness, conduction type, and material composition. We have fabricated 1.55 mu m InGaAsP/InP strained multiple quantum well (MQW) **DFB lasers** having different absorptive **grating** thickness and different conduction type. Lasing characteristics of these lasers were compared with regard to **coupling coefficients** and absorption saturation. Through net gain measurement, information useful for designing and optimizing the absorptive **grating** was obtained.
Subfile: A B
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22/3,AB/12 (Item 12 from file: 2)
DIALOG(R)File 2:INSPEC

5612981 INSPEC Abstract Number: A9715-4280R-002, B9708-4130-018
Title: **Coupling coefficients** of gratings with graded refractive index waveguides
Author(s): Chen, C.; Chen, L.; Wang, Q.
Author Affiliation: Inst. of Semicond., Acad. Sinica, Beijing, China
Journal: Optical and Quantum Electronics vol.29, no.5 p.539-53
Publisher: Chapman & Hall,
Publication Date: May 1997 Country of Publication: UK
CODEN: OQELDI ISSN: 0306-8919
SICI: 0306-8919(199705)29:5L.539:CCGW;1-L
Material Identity Number: O044-97005
Language: English
Abstract: In this paper, the effective **coupling coefficient** k/sub eff/ and the self-**coupling coefficient** zeta /sub 1/ are

introduced to describe the characteristic of gratings in a resonant situation when the effects of radiation and other partial waves coupling are considered. The dependence of these two **coupling coefficients** on **grating** tooth shapes and depths and the dimensions of graded refractive index (GRIN) waveguides is numerically analysed. The results show that the gratings with linear GRIN waveguides have the largest K/sub eff/ . The possibility of realizing a complex-coupled **DFB laser**, even a pure **gain** or loss **coupled DFB laser**, employing only a real refractive index coupled **grating** is also discussed.

Subfile: A B

22/3,AB/13 (Item 13 from file: 2)

DIALOG(R)File 2:INSPEC

5364681 INSPEC Abstract Number: A9620-4255P-038, B9610-4320J-124

Title: Side mode suppression ratio for 1.3 mu m loss coupled **DFB lasers** with large loss **coupling coefficient**

Author(s): Zhang, L.M.; Ackerman, D.A.; Hybertsen, M.S.

Author Affiliation: AT&T Bell Labs., Murray Hill, NJ, USA

Journal: Proceedings of the SPIE - The International Society for Optical Engineering Conference Title: Proc. SPIE - Int. Soc. Opt. Eng. (USA) vol.2693 p.636-9

Publisher: SPIE-Int. Soc. Opt. Eng,

Publication Date: 1996 Country of Publication: USA

CODEN: PSISDG ISSN: 0277-786X

SICI: 0277-786X(1996)2693L.636:SMSR;1-0

Material Identity Number: C574-96154

U.S. Copyright Clearance Center Code: 0 8194 2067 0/96/$6.00

Conference Title: Physics and Simulation of Optoelectronic Devices IV

Conference Sponsor: SPIE

Conference Date: 29 Jan.-2 Feb. 1996 Conference Location: San Jose, CA, USA

Language: English

Abstract: Single mode yield is a substantial issue for distributed feedback (**DFB**) **lasers** manufactured with an HR facet reflection coating at one end to maximize the power output for telecommunications applications. It has been demonstrated that high single mode yield can be achieved by introducing the **gain**/loss **coupled** DFB. In this paper, we study the side mode suppression ratio (SMSR) of antiphase, loss coupled **DFB laser** with large loss **coupling coefficient** near and well above the lasing threshold. The injection current dependence of the side mode suppression ratio of an HR-AR facet coated loss-coupled **DFB laser** is examined through numerical simulation and experiments. The results show that, although the SMSR can be very good just above the threshold, a dramatic drop in the SMSR can occur due to the competition between the spatial hole burning and the loss in the **grating** at modest injection currents.

Subfile: A B

22/3,AB/14 (Item 14 from file: 2)

DIALOG(R)File 2:INSPEC

5042201 INSPEC Abstract Number: A9519-4255P-039, B9510-4320J-070

Title: **Gain-coupled** strained layer MQW-**DFB lasers** with an essentially simplified fabrication process for lambda =1.55 mu m
Author(s): Rast, A.; Johannes, T.W.; Harth, W.; Rieger, J.
Author Affiliation: Lehrstuhl fur Allgemeine Elektrotechnik und Angewandte Elektronik, Tech. Univ. Munchen, Germany
Journal: IEEE Photonics Technology Letters vol.7, no.8 p.830-2
Publication Date: Aug. 1995 Country of Publication: USA
CODEN: IPTLEL ISSN: 1041-1135
U.S. Copyright Clearance Center Code: 1041-1135/95/$04.00
Language: English
Abstract: A **gain-coupled** (GC) strained-layer (SL) multi-quantum-well (MQW) distributed-feedback (**DFB**) **laser** with a metallized surface **grating** and a substantially simplified fabrication process made by single-step epitaxy without corrugation overgrowth is described. The complex **coupling coefficient** can be adjusted by the contact metallization. Room-temperature single-mode continuous-wave (CW) operation with a threshold current of 22 mA, an output power of 20 mW, and a linewidth of 2.5 MHz is demonstrated.
Subfile: A B

22/3,AB/15 (Item 15 from file: 2)
DIALOG(R)File 2:INSPEC

5000920 INSPEC Abstract Number: A9516-4260H-002, B9509-4330-002
Title: Nonlinear analysis of a dielectric distributed feedback laser with complex **coupling coefficient**
Author(s): Szczepanski, P.; Weglik, P.
Author Affiliation: Inst. of Microelectron. & Optoelectron., Warsaw Univ. of Technol., Poland
Journal: IEEE Journal of Quantum Electronics vol.31, no.7 p.1337-43
Publication Date: July 1995 Country of Publication: USA
CODEN: IEJQA7 ISSN: 0018-9197
U.S. Copyright Clearance Center Code: 0018-9197/95/$04.00
Language: English
Abstract: An approximate analysis of the nonlinear operation of **DFB** a dielectric **laser** with complex **coupling coefficient** is presented, An expression relating the small signal gain to the output power and the system parameters, including the spatial hole burning effect, is obtained. It is shown that the gain **grating**, the loss **grating**, and the higher order Bragg **grating** all contribute to laser operation above the threshold in a different manner. Moreover, it is possible to achieve a "negative" gain effect in the partly **gain-coupled** structure operating above the threshold, which depends on the output power level, the distributed loss level and the spatial hole burning effect.
Subfile: A B

22/3,AB/16 (Item 16 from file: 2)
DIALOG(R)File 2:INSPEC

4988484 INSPEC Abstract Number: A9515-4255P-004, B9508-4320J-039
Title: Mode selection in complex-coupled semiconductor **DFB lasers**
Author(s): Flanigan, B.J.; Carroll, J.E.
Author Affiliation: Dept. of Eng., Cambridge Univ., UK

Journal: Electronics Letters vol.31, no.12 p.977-9
Publication Date: 8 June 1995 Country of Publication: UK
CODEN: ELLEAK ISSN: 0013-5194
U.S. Copyright Clearance Center Code: 0013-5194/95/$10.00
Language: English
Abstract: Mode suppression in complex-coupled **DFB lasers** with both in-phase and antiphase gain gratings is examined through a novel use of power balance. The theory is then backed up by more detailed arguments using a dynamic time domain model. The phase of the gain **grating** in relation to the index **grating** determines which mode of the DFB is suppressed. Longitudinal variations in the **gain coupling coefficient** caused by spatial hole burning provide additional side-mode suppression mechanisms.
Subfile: A B

22/3,AB/17 (Item 17 from file: 2)
DIALOG(R)File 2:INSPEC

4955713 INSPEC Abstract Number: A9512-4260F-010, B9507-4320J-043
Title: Frequency modulation characteristics of absorptive-**grating gain-coupled DFB lasers** : spatial hole burning self-suppression effect
Author(s): Sudoh, T.K.; Nakano, Y.; Tada, K.; Kikuchi, K.; Hirata, T.; Hosomatsu, H.
Author Affiliation: Dept. of Electron. Eng., Tokyo Univ., Japan
p.572-3
Publisher: IEEE, New York, NY, USA
Publication Date: 1993 Country of Publication: USA xxvi+832 pp.
ISBN: 0 7803 1263 5
Conference Title: Proceedings of LEOS '93
Conference Date: 15-18 Nov. 1993 Conference Location: San Jose, CA, USA
Language: English
Abstract: The spatial hole burning (SHB) in distributed feedback (**DFB) lasers** limits longitudinal-mode stability and occasionally results in spectral linewidth broadening or multiple-mode oscillation. Introduction of **gain coupling** is one of effective methods to reduce SHB. However, SHB may still exist in the **gain-coupled** (GC) **DFB laser** due to inappropriate coupling strength, parasitic index coupling, and facet reflection in practical devices. This paper describes self-suppression effect of SHB in absorptive-**grating** GC **DFB lasers** which is observed through the measurement of frequency modulation (FM) characteristics. This effect is attributed to the photon-density-dependent **coupling coefficient** in the **gain -coupled** cavity.
Subfile: A B

22/3,AB/18 (Item 18 from file: 2)
DIALOG(R)File 2:INSPEC

4752278 INSPEC Abstract Number: A9420-4260B-001, B9410-4320J-065
Title: Long-wavelength InGaAsP/InP multiquantum well distributed feedback and distributed Bragg reflector lasers grown by chemical beam epitaxy
Author(s): Tsang, W.T.; Wu, M.C.; Chen, Y.K.; Choa, F.S.; Logan, R.A.;

Chu, S.N.G.; Sergent, A.M.; Magill, P.; Reichmann, K.C.; Burrus, C.A.
Author Affiliation: AT&T Bell Labs., Murray Hill, NJ, USA
Journal: IEEE Journal of Quantum Electronics vol.30, no.6 p.1370-80
Publication Date: June 1994 Country of Publication: USA
CODEN: IEJQA7 ISSN: 0018-9197
U.S. Copyright Clearance Center Code: 0018-9197/94/$04.00
Language: English
Abstract: We demonstrated the successful operation of long-wavelength InGaAsP low threshold-current index-coupled and **gain-coupled DFB lasers** grown by chemical beam epitaxy (CBE). For index-coupled **DFB lasers**, buried-heterostructure six-QW **DFB lasers** (250 mu m long and as-cleaved) operated at 1.55 mu m with CW threshold currents 10-15 mA and slope efficiencies up to 0.35 mW/mA (both facets). A side-mode suppression ratio (SMSR) as high as 49 dB was obtained. The lasers operated in the same range even at high temperatures (70 degrees C checked). For **gain-coupled DFB lasers**, **gain-coupling** is accomplished by using a InGaAsP quaternary **grating** or quantum-well **grating** that absorbs the DFB emission. The use of a quantum-well **grating**, in particular, greatly facilitates the reproducible regrowth (defect-free) over **grating** and the control of the **coupling coefficient**. CW threshold currents mere in the range of 10-15 mA for 250- mu m and 13-18 mA for 250- mu m and 500- mu m cavities, respectively. Slope efficiencies were high, approximately 0.4 mW/mA (both facets). SMSR was as high as 52 dB and remained in the same DFB mode with SMSR staying approximately 50 dB throughout the entire current range. Linewidth*power products of 1.9-4.0 mere measured with minimum linewidths of 1.8-2.2 MHz. No detectable chirp was measured under 2.5 Gb/s modulation. Unlike index-coupled **DFB lasers** in which mode partition events decrease slowly even when biased above threshold, these lasers have mode partition events shut off sharply as bias approaches threshold (>or approximately=0.95 I/sub th/). A very small dispersion penalty of 1.0 dB was measured at 10/sup -11/ BER in transmission experiments using these lasers as sources at 1.7 Gb/s over an amplified fiber system of 230 km. No self-pulsation was observed in these **gain-coupled DFB lasers**. Gain-switching at 4 GHz with a 100% optical modulation depth and a FWHM pulse width of 23 ps was achieved with these **gain-coupled DFB lasers**. The peak power was approximately 72 mW and the FWHM bandwidth was 0.14 nm. We also fabricated InGaAs/InGaAsP multiquantum-well DBR lasers by CBE. Taking advantage of uniform thickness growth and proper design of weak and long gratings, a record high SMSR of 58.5 dB was obtained.
Subfile: A B

22/3,AB/19 (Item 19 from file: 2)
DIALOG(R)File 2:INSPEC

4344767 INSPEC Abstract Number: A9306-4260B-037, B9303-4320J-105
Title: Long wavelength InGaAsP/InP distributed feedback lasers grown by chemical beam epitaxy
Author(s): Tsang, W.T.; Choa, F.S.; Wu, M.C.; Chen, Y.K.; Logan, R.A.; Chu, S.N.G.; Sergent, A.M.; Magill, P.; Reichmann, K.C.; Burrus, C.A.
Author Affiliation: AT&AT Bell Lab., Murray Hill, NJ, USA
Journal: Journal of Crystal Growth Conference Title: J. Cryst. Growth (Netherlands) vol.124, no.1-4 p.716-22
Publication Date: Nov. 1992 Country of Publication: Netherlands
CODEN: JCRGAE ISSN: 0022-0248
Material Identity Number: J037-92018
U.S. Copyright Clearance Center Code: 0022-0248/92/$05.00

Conference Title: Metalorganic Vapor Phase Epitaxy 1992. Sixth International Conference
Conference Sponsor: IEEE; American Assoc. Crystal Growth
Conference Date: 8-11 June 1992 Conference Location: Cambridge, MA, USA
Language: English
Abstract: The authors have demonstrated successful operation of long wavelength InGaAsP low threshold-current **gain-coupled DFB lasers**. This is accomplished by using a InGaAsP quarternary **grating** or quantum well **grating** that absorbs the DFB emission. The use of a quantum well **grating**, in particular, greatly facilitates the reproducible regrowth (defect-free) over **grating** and the control of the **coupling coefficient**. CW threshold currents were in the range of 10-15 mA for 250 mu m and 13-18 mA for 250 and 500 mu m cavities, respectively. Slope efficiencies were high, ~0.4 mW/mA (both facets). SMSR was as high as 52 kB and remained in the same DFB mode with SMSR staying ~50 dB throughout the entire current range. Linewidth*power products of 1.9-4.0 were measured with minimum linewidths of 1.8-2.2 MHz. No detectable chirp was measured under 2.5 Gb/s modulation. Unlike index-coupled **DFB lasers** in which mode partition events decrease slowly even when biased above threshold, these lasers have mode partition events shut off sharply as bias approaches threshold (>or approximately=0.95 I/sub th/). A very small dispersion penalty of 1.0 dB was measured at 10/sup -11/ BER in transmission experiments using these lasers as sources at 1.7 Gb/s over an amplified fiber system of 239 km. No self-pulsation was observed in these **gain-coupled DFB lasers**.
Subfile: A B

22/3,AB/20 (Item 20 from file: 2)
DIALOG(R)File 2:INSPEC

03995002 INSPEC Abstract Number: A91126752, B91070365
Title: **Coupling coefficients** in **gain-coupled DFB lasers** : inherent compromise between coupling strength and loss
Author(s): David, K.; Buus, J.; Morthier, G.; Baets, R.
Author Affiliation: Lab. of Electromagn. & Acoust., Gent Univ., Belgium
Journal: IEEE Photonics Technology Letters vol.3, no.5 p.439-41
Publication Date: May 1991 Country of Publication: USA
CODEN: IPTLEL ISSN: 1041-1135
U.S. Copyright Clearance Center Code: 1041-1135/91/0500-0439$01.00
Language: English
Abstract: A theoretical analysis of the **gain-coupling coefficient** for distributed feedback (**DFB**) **lasers** with first-order, rectangular, gain, or loss gratings is presented. For the structure with gain **grating**, the dependence of the **gain-coupling coefficient** on the modal gain has been taken into account for the first time. In both structures, an inherent compromise between coupling strength and extra modal loss is found. The results show that significant **gain-coupling coefficient** values are feasible.
Subfile: A B

22/3,AB/21 (Item 1 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04890485
E.I. No: EIP97123960026
Title: Very low threshold and high power CW operation in 1.55 mu m **gain-coupled DFB lasers** with periodically etched quantum wells
Author: Talneau, A.; Charil, J.; Ougazzaden, A.
Corporate Source: France Telecom/CNET/DTD, Bagneux, Fr
Source: Electronics Letters v 33 n 22 Oct 23 1997. p 1881-1883
Publication Year: 1997
CODEN: ELLEAK ISSN: 0013-5194
Language: English
Abstract: The authors demonstrate extremely low threshold and high CW output power in 1.55 mu m **gain coupled DFB lasers.** The structure is an MQW strain compensated active layer with first-order **grating** etched on the upper wells. The lowest thresholds of 2.5mA at 20 degree C and 10mA at 80 degree C are obtained using one HR facet coating. With an AR front facet, the CW output is increased up to 40mW, while the threshold current remains less than 10mA. (Author abstract) 5 Refs.

22/3,AB/22 (Item 2 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04833510
E.I. No: EIP97103847155
Title: **Gain-coupled** distributed-feedback laser triode - novel structure for tuning **coupling coefficient**
Author: Kawanishi, Hidekazu; Fukuoka, Tetsuya; Nakano, Yoshiaki; Tada, Kunio
Corporate Source: Univ of Tokyo, Tokyo, Jpn
Conference Title: Proceedings of the 1997 Pacific Rim Conference on Lasers and Electro-Optics, CLEO/Pacific Rim
Conference Location: Chiba, Jpn Conference Date: 19970714-19970718
E.I. Conference No.: 46984
Source: Pacific Rim Conference on Lasers and Electro-Optics, CLEO - Technical Digest 1997. IEEE, Piscataway, NJ, USA. p 141
Publication Year: 1997
CODEN: 002223
Language: English
Abstract: A three-terminal **gain-coupled** (GC) distributed feedback (**DFB**) **laser** where the third terminal is connected to its absorptive **grating** controls **coupling coefficient,** absorption saturation in the **grating,** wavelength chirping, and linewidth enhancement factor. With this, Q switching and injection-current **grating** is also possible.

22/3,AB/23 (Item 3 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04762128
E.I. No: EIP97073743836
Title: First observation of changing **coupling coefficients** in a **gain-coupled DFB laser** with absorptive **grating** by automatic parameter extraction from subthreshold spectra
Author: Nakura, Toru; Sato, Kenji; Funabashi, Masaki; Morthier, Geert; Baets, Roel; Nakano, Yoshiaki; Tada, Kunio

Corporate Source: Univ of Tokyo, Tokyo, Jpn
Conference Title: Proceedings of the 1997 Conference on Lasers and Electro-Optics, CLEO
Conference Location: Baltimore, MD, USA Conference Date: 19970518-19970523
E.I. Conference No.: 46669
Source: Conference Proceedings - Lasers and Electro-Optics Society Annual Meeting-CLEO v 11 1997. IEEE, Piscataway, NJ, USA,97CH36110. p 399-400
Publication Year: 1997
CODEN: CPLSE4
Language: English
Abstract: The changing **coupling coefficients** in a **gain-coupled DFB laser** with an absorptive **grating** resulting from saturable absorption was made possible by the parameter extraction program. The index- and **gain-coupling coefficients**, effective refractive index and its wavelength dispersion, **grating** facet phases, and gain profile were determined based on the coupled wave equations and the transfer matrix analysis of the parameter extraction program. 1 Refs.

22/3,AB/24 (Item 4 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04746079
E.I. No: EIP97073724882
Title: Comparison of InGaAs absorptive **grating** structures in 1.55 mu m InGaAsP/InP strained MQW **gain-coupled DFB lasers**
Author: Funabashi, Masaki; Kawanishi, Hidekazu; Sudoh, Tsurugi K.; Nakura, Toru; Schmitz, Dietmar; Schulte, Frank; Nakano, Yoshiaki; Tada, Kunio
Corporate Source: Univ of Tokyo, Tokyo, Jpn
Conference Title: Proceedings of the 1997 International Conference on Indium Phosphide and Related Materials
Conference Location: Cape Cod, MA, USA Conference Date: 19970511-19970515
E.I. Conference No.: 46587
Source: Conference Proceedings - International Conference on Indium Phosphide and Related Materials 1997. IEEE, Piscataway, NJ, USA,97CH36058. p 292-295
Publication Year: 1997
CODEN: CPRMEG
Language: English
Abstract: In **gain-coupled** (GC) distributed-feedback (**DFB**) **lasers** of absorptive **grating** type, the device characteristics depend very much on the absorptive **grating** configuration such as duty cycle, layer thickness, conduction type, and material composition. We have fabricated 1.55 mu m InGaAsP/InP strained multiple quantum well (MQW) **DFB lasers** having different absorptive **grating** thickness and different conduction type. Lasing characteristics of these lasers were compared in view of **coupling coefficients** and absorption saturation. Through net gain measurement, information useful for designing and optimizing the absorptive **grating** was obtained. (Author abstract) 6 Refs.

22/3,AB/25 (Item 5 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04329974
E.I. No: EIP95112933568
Title: Single-lobed far-field radiation pattern from surface-emitting complex-coupled distributed-feedback diode lasers
Author: Kasraian, Masoud; Botez, Dan
Corporate Source: Univ of Wisconsin-Madison, Madison, WI, USA
Source: Applied Physics Letters v 67 n 19 Nov 6 1995. p 2783-2785
Publication Year: 1995
CODEN: APPLAB ISSN: 0003-6951
Language: English
Abstract: Some results of the theoretical analysis of an in-phase, complex-coupled distributed-feedback (**DFB**) **laser** with a second-order **grating** are presented. It is shown that the in-phase second-order complex-coupled **DFB laser** structure will fundamentally provide orthonormal emission of light having a single-lobed far-field radiation pattern as long as modal discrimination based on gain overlap factor is larger than that based on radiation losses. 35 Refs.

22/3,AB/26 (Item 6 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04244275
E.I. No: EIP95092850453
Title: **Gain-coupled** strained layer MQW-**DFB lasers** with an essentially simplified fabrication process for lambda equals 1.55 mu m
Author: Rast, A.; Johannes, T.W.; Harth, W.; Rieger, J.
Corporate Source: Technische Univeristaet Muenchen, Muenchen, Ger
Source: IEEE Photonics Technology Letters v 7 n 8 Aug 1995. p 830-832
Publication Year: 1995
CODEN: IPTLEL ISSN: 1041-1135
Language: English
Abstract: A **gain-coupled** (GC) strained-layer (SL) multi-quantum-well (MQW) distributed-feedback (**DFB**) **laser** with a metallized surface **grating** and a substantially simplified fabrication process made by single-step epitaxy without corrugation overgrowth is described. The complex **coupling coefficient** can be adjusted by the contact metallization. Room-temperature single-mode continuous-wave (CW) operation with a threshold current of 22 mA, an output power of 20 mW, and a linewidth of 2.5 MHz is demonstrated. (Author abstract) 18 Refs.

22/3,AB/27 (Item 7 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04204784
E.I. No: EIP95052693041
Title: New concept of single-mode resonator for distributed feedback semiconductor and fiber lasers
Author: Seminogov, Vladimir N.; Khudobenko, Alexander I.; Panchenko, Vladislav Y.; Sokolov, Victor I.
Corporate Source: Scientific Research Cent. for Technological Lasers, Troitsk, Moscow Region, Russia
Conference Title: Laser Diodes and Applications

Conference Location: San Jose, CA, USA Conference Date: 19950208-19950210
E.I. Conference No.: 22231
Source: Proceedings of SPIE - The International Society for Optical Engineering v 2382 1995. Society of Photo-Optical Instrumentation Engineers, Bellingham, WA, USA. p 224-234
Publication Year: 1995
CODEN: PSISDG ISSN: 0277-786X ISBN: 0-8194-1729-7
Language: English
Abstract: The new concept of a single-mode resonator for single-frequency distributed feedback (**DFB**) **lasers** is presented. This concept is based on an embedded nonharmonic distributed Bragg structure with a sinusoidally modulated **coupling coefficient**, which is a combination of two superimposed sinusoidal Bragg gratings of equal heights and slightly different periods. Resonant frequencies and corresponding threshold gains of such a distributed resonator are calculated theoretically by using the coupled-mode theory. The designed resonator provides stable single-frequency oscillation and has lasing characteristics (frequencies and thresholds) very similar to those of a well- known distributed resonator with quarter-wavelength shift. The developed concept of a resonator with a sinusoidally modulated **coupling coefficient** can be applied both to semiconductor laser diodes with incorporated Bragg relief **grating** and to **DFB** fiber **lasers** with refractive index **grating**. The important advantage of designed new single-mode Bragg structure, as compared to quarter- wavelength-shifted structure, is that it can be fabricated very easily on semiconductor surfaces and in photosensitive fibers by direct three-beam holographic writing. 11 Ref.

22/3,AB/28 (Item 8 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04082156
E.I. No: EIP95022583625
Title: Analysis and simulation of **gain coupled** (GC)-**DFB** semiconductor **lasers**
Author: Randone, Fabio; Montrosset, Ivo
Corporate Source: Politecnico di Torino, Torino, Italy
Conference Title: Proceedings of the 1994 IEEE LEOS Annual Meeting. Part 1 (of 2)
Conference Location: Boston, MA, USA Conference Date: 19941031-19941103
E.I. Conference No.: 42506
Source: IEEE LEOS Annual Meeting - Proceedings v 1 1994. IEEE, Piscataway, NJ, USA,94CH3371-2. p 105-106
Publication Year: 1994
CODEN: 001893
Language: English
Abstract: In this paper is presented a comparison between differents GC-**DFB lasers** realized with an absorption or a gain or a second order **grating**. Light-current characteristics, FM response, linewidth, side mode suppression ratio are presented. (Author abstract) 4 Refs.

22/3,AB/29 (Item 9 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

03840764

E.I. No: EIP94041259342
Title: Frequency modulation characteristics of absorptive-**grating** **gain-coupled** DBF lasers - spatial hole burning self-suppression effect
Author: Sudoh, Tsurugi K.; Nakano, Yoshaiaki; Tada, Kunio; Kikuchi, Kazuro; Hirata, Takaaki; Hosomatsu, Haruo
Corporate Source: Univ of Tokyo, Tokyo, Jpn
Conference Title: Annual Meeting of the IEEE Lasers and Electro-Optics Society
Conference Location: San jose, CA, USA Conference Date: 19931115-19931118
E.I. Conference No.: 19848
Source: Conference Proceedings - Lasers and Electro-Optics Society Annual Meeting 1993. Publ by IEEE, IEEE Service Center, Piscataway, NJ, USA,93CH3297-9. p 572-573
Publication Year: 1993
ISBN: 0-7803-1263-5
Language: English
Abstract: The spatial hole burning (SHB) in distributed feed back (DBF) lasers limits longitudinal-mode stability and occasionally results in spectral linewidth broadening or multiple-mode oscillation. SHB may still exist in the **gain-coupled** (GC) **DFB laser** due to inappropriate coupling strength, parasitic index coupling, and facet reflection in practical devices. This paper describes self-suppression effect of SHB in absorptive-**grating** GC **DFB lasers** which is observed through the measurement of frequency modulation (FM) characteristics. This effect is attributed to the photon-density-dependent **coupling coefficient** in the **gain-coupled** cavity. 4 Refs.

22/3,AB/30 (Item 1 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11751118 Genuine Article#: 690FZ Number of References: 7
Title: Characteristics of GaAs/AlGaAs quantum-wire distributed-feedback lasers with different gain modifications (ABSTRACT AVAILABLE)
Author(s): Kim TG (REPRINT)
Corporate Source: KwangWoon Univ,Dept Semicond & New Mat Engn,Seoul 139701//South Korea/ (REPRINT); KwangWoon Univ,Dept Semicond & New Mat Engn,Seoul 139701//South Korea/
Journal: JOURNAL OF THE KOREAN PHYSICAL SOCIETY, 2003, V42, N6 (JUN), P 791-794
ISSN: 0374-4884 Publication date: 20030600
Publisher: KOREAN PHYSICAL SOC, 635-4, YUKSAM-DONG, KANGNAM-KU, SEOUL 135-703, SOUTH KOREA
Language: English Document Type: ARTICLE
Abstract: GaAs/AlGaAs quantum-wire (QWR) **gain-coupled** distributed-feedback (GC-**DFB**) **lasers** were fabricated and characterized. Interestingly, as the shape of the active **grating** was varied, the lasing characteristics changed greatly; for example, one laser with sharp gratings lased at a threshold current of 13 mA while another one with dull gratings lased at 230 mA. This may be due to a change in the **gain coupling coefficient** with the shape of the QWR active **grating**. Little observation of the stopband and the wavelength consistency between the lasing and the photoluminescence peaks of the QWRs also provided evidence for lasing via GC-DFB effects in these devices.

22/3,AB/31 (Item 2 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11587941 Genuine Article#: 671ZM Number of References: 25
Title: Numerical simulantion of a pulsed laser pumped distributed-feedback waveguided dye laser by coupled-wave theory (ABSTRACT AVAILABLE)
Author(s): Zuo DL (REPRINT) ; Oki Y; Maeda M
Corporate Source: Huazhong Univ Sci & Technol,State Key Lab Laser Technol,Wuhan 430074//Peoples R China/ (REPRINT); Kyushu Univ,Grad Sch Informat Sci & Elect Engn,Fukuoka 8128581//Japan/
Journal: IEEE JOURNAL OF QUANTUM ELECTRONICS, 2003, V39, N5 (MAY), P673-680
ISSN: 0018-9197 Publication date: 20030500
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394 USA
Language: English Document Type: ARTICLE
Abstract: A dynamic model of pulsed **laser** pumped distributed-feedback (**DFB**) waveguided dye **laser** based on a coupled-wave theory is described. Due to the periodical distribution of the intensities of pump I source and stimulated emission along the waveguide, the rate equations of the population densities are turned into the equations of the Fourier **coefficients**. **Coupled**-wave equations of optical fields are used to simulate the laser oscillation. Besides the temporal evolution of the output intensity, the spectra can also be obtained by the Fourier transform of the optical fields. Two different configurations. of the waveguided dye. **laser**, prefabricated **DFB** (mainly index coupling), first- and second-order holographic DFB (dynamic **gain-coupling**), are considered in the model. The simulation shows that: 1) the temporal waveforms of the holographic DFB consist of sharp spikes; 2) the broadened spectral widths resulted from the possible nonuniformities in propagation constant or **grating** period are less than 50 pm except for the second-order holographic DFB; and 3) strong parasitic oscillations can be observed in the second-order holographic DFB with terminal reflection. These results and the comparisons of some of them to the experiments are reported.

22/3,AB/32 (Item 3 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

10615144 Genuine Article#: 547LZ Number of References: 26
Title: Electroabsorption modulated laser for long transmission spans (ABSTRACT AVAILABLE)
Author(s): Salvatore RA (REPRINT) ; Sahara RT; Bock MA; Libenzon I
Corporate Source: Corning Lasertron,Bedford//MA/01730 (REPRINT); Corning Lasertron,Bedford//MA/01730
Journal: IEEE JOURNAL OF QUANTUM ELECTRONICS, 2002, V38, N5 (MAY), P464-476
ISSN: 0018-9197 Publication date: 20020500
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394 USA
Language: English Document Type: ARTICLE
Abstract: Strain-compensated AlGaInAs quantum-well electroabsorption modulated lasers (EMLs) transmit at 10 Gbits/s on uncompensated transmission spans of >75 km of standard fiber and >225 km of MetroCor fiber. Details of the design, fabrication, and testing are presented, A complex-coupled distributed feedback (DFB) **grating** is used to enable high output power. The epitaxy and chip structure are described.

The paper studies what is needed to accomplish long-span transmission in terms of minimum physical requirements for laser mode control, facet reflection, index **grating** strength, laser-modulator matching, laser-modulator electrical isolation, modulator extinction ratio, modulator capacitance, linewidth enhancement factor, etc. The interaction of the modulator with the laser is analyzed and a requirement for this structure is computed for the electrical isolation resistance between modulator and laser contacts. Stability of the laser source is discussed and a method is derived for determining the **grating's gain-coupling coefficient** at operating power. Chirp due to the modulator is analyzed. Nonzero chirp of the modulator is shown to have beneficial impact on the quality of the signal after transmission. The effect of a bias-dependent alpha parameter is analyzed. Because bit-error rate is a strong function of mean alpha parameter and not a strong function of the range of alpha during nonreturn-to-zero modulation, we determine that tuning the chirp of the EML modulator to suit different fiber types (MetroCor, SMF-28, etc.) is practical. Specific tradeoffs are also required. Experimental results verify the analysis.

22/3,AB/33 (Item 4 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09321656 Genuine Article#: 390UU Number of References: 24
Title: Second- and higher order resonant gratings with gain or loss - Part I: Green's function analysis (ABSTRACT AVAILABLE)
Author(s): Shams-Zadeh-Amiri AM (REPRINT) ; Hong J; Li X; Huang WP
Corporate Source: Univ Waterloo,Dept Elect & Comp Engn,Waterloo/ON N2L 3G1/Canada/ (REPRINT); Univ Waterloo,Dept Elect & Comp Engn,Waterloo/ON N2L 3G1/Canada/; Nortel Networks,Ottawa/ON/Canada/; McMaster Univ,Dept Elect & Comp Engn,Hamilton/ON L8S 4L8/Canada/
Journal: IEEE JOURNAL OF QUANTUM ELECTRONICS, 2000, V36, N12 (DEC), P 1421-1430
ISSN: 0018-9197 Publication date: 20001200
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394 USA
Language: English Document Type: ARTICLE
Abstract: This paper addresses a systematic method for obtaining the **coupling coefficients** due to diffraction orders less than the **grating** order of second- and higher order resonant complex gratings in a multilayer structure. This method is based on an improved Green's function, and its distinguishing feature is its use of the transfer matrix method to simplify the theoretical analysis for obtaining the Green's function in multilayer structures. More importantly, it is also shown that by introducing gain or loss in second- and higher order resonant gratings, the range of controlling the total **coupling coefficient** becomes wider than those in first-order complex gratings or second-order index gratings, Concepts like in-phase and anti-phase gratings are generalized in this type of **grating**. Finally, guidelines for designing complex-coupled **DFB lasers** with second- and third-order **grating** are also presented.

22/3,AB/34 (Item 5 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

07661366 Genuine Article#: 193KE Number of References: 10
Title: 1.5 mu m InGaAsP/InP strained MQW **gain-coupled DFB laser** with an improved periodically modulated injection-carrier **grating** (ABSTRACT AVAILABLE)
Author(s): Luo Y (REPRINT) ; Wen GP; Gan YN; Zhang KQ; Sudoh TK; Sudo S; Nakano Y; Tada K
Corporate Source: TSING HUA UNIV,DEPT ELECT ENGN/BEIJING 100084//PEOPLES R CHINA/ (REPRINT); UNIV TOKYO,DEPT ELECT ENGN/TOKYO 113//JAPAN/
Journal: JOURNAL OF THE KOREAN PHYSICAL SOCIETY, 1999, V34, S (APR), P S101-S103
ISSN: 0374-4884 Publication date: 19990400
Publisher: KOREAN PHYSICAL SOC, 635-4, YUKSAM-DONG, KANGNAM-KU, SEOUL 135-703, SOUTH KOREA
Language: English Document Type: ARTICLE
Abstract: A 1.55 mu m InGaAsP/InP strained multiple quantum well (MQW) distributed feedback (**DFB**) **laser** with an improved periodically modulated injection-carrier **grating** is reported for the first time. In this laser structure, the effect of current blocking **grating** is enhanced by optimizing the doping level of its surrounding layers, therefore, large **gain coupling coefficient** can be expected. The device is fabricated by hybrid growth of MOVPE and LPE. A single-mode oscillation yield as high as 80 % is achieved under the condition of two cleaved facets.

22/3,AB/35 (Item 6 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

05024547 Genuine Article#: UZ510 Number of References: 6
Title: **COUPLING-COEFFICIENTS** OF **GAIN-COUPLED** DISTRIBUTED-FEEDBACK LASERS WITH ABSORPTIVE **GRATING** (Abstract Available)
Author(s): CHEN CH; CHEN LH; WANG QM
Corporate Source: CHINESE ACAD SCI,INST SEMICOND,NIOEL,POB 912/BEIJING 100083//PEOPLES R CHINA/
Journal: ELECTRONICS LETTERS, 1996, V32, N14 (JUL 4), P1288-1290
ISSN: 0013-5194
Language: ENGLISH Document Type: ARTICLE
Abstract: An effective coupling efficient is introduced for **gain-coupled** distributed feedback lasers with absorptive **grating** . When radiation and other partial wave coupling effects are considered, the effective **coupling coefficient** will change significantly. In some cases, it will become real, although both loss and index coupling are presented.

22/3,AB/36 (Item 7 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

04218674 Genuine Article#: RP038 Number of References: 18
Title: **GAIN-COUPLED** STRAINED-LAYER MQW-**DFB LASERS** WITH AN ESSENTIALLY SIMPLIFIED FABRICATION PROCESS FOR LAMBDA=1.55 MU-M (Abstract Available)
Author(s): RAST A; JOHANNES TW; HARTH W; RIEGER J
Corporate Source: TECH UNIV MUNICH,LEHRSTUHL ALLGEMEINE ELEKTROTECH & ANGEW ELEKTR/D-80290 MUNICH//GERMANY/; SIEMENS AG,ZFE/D-81730 MUNICH//GERMANY/
Journal: IEEE PHOTONICS TECHNOLOGY LETTERS, 1995, V7, N8 (AUG), P830-832

ISSN: 1041-1135
Language: ENGLISH Document Type: ARTICLE
Abstract: A **gain-coupled** (GC) strained-layer (SL) multi-quantum-well (MQW) distributed-feedback (**DFB**) **laser** with a metallized surface **grating** and a substantially simplified fabrication process made by single-step epitaxy without corrugation overgrowth is described, The complex **coupling coefficient** can be adjusted by the contact metallization. Room-temperature single-mode continuous-wave (CW) operation with a threshold current of 22 mil, an output power of 20 mW, and a linewidth of 2.5 MHz is demonstrated.

22/3,AB/37 (Item 8 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01742523 Genuine Article#: HX435 Number of References: 14
Title: REDUCTION OF EFFECTIVE LINEWIDTH ENHANCEMENT FACTOR-ALPHA-EFF OF **DFB LASERS** WITH COMPLEX **COUPLING-COEFFICIENTS**
(Abstract Available)
Author(s): KUDO K; SHIM JI; KOMORI K; ARAI S
Corporate Source: TOKYO INST TECHNOL,DEPT PHYS ELECTR/TOKYO 152//JAPAN/
Journal: IEEE PHOTONICS TECHNOLOGY LETTERS, 1992, V4, N6 (JUN), P531-534
Language: ENGLISH Document Type: ARTICLE
Abstract: The effective linewidth enhancement factor alpha(eff) of **DFB lasers** which have both **gain** and index **coupling coefficients** is theoretically analyzed. The unique reduction mechanism of alpha(eff) due to the optical negative feedback of modal phase and modal **gain** in **gain coupled** **DFB lasers** was found for the first time. The numerical result showed that alpha(eff) can be reduced to almost one half of material defined linewidth enhancement factor-alpha when there exists an index **coupling coefficient** comparable to the **gain** **coupling coefficient.**

22/3,AB/38 (Item 9 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01412510 Genuine Article#: GX354 Number of References: 9
Title: INGAAS INP **GAIN-COUPLED** DISTRIBUTED FEEDBACK LASER WITH A CORRUGATED ACTIVE LAYER (Abstract Available)
Author(s): INOUE T; NAKAJIMA S; LUO Y; OKI T; IWAOKA H; NAKANO Y; TADA K
Corporate Source: OPT MEASUREMENT TECHNOL DEV CO LTD,2-11-13 NAKACHO/MUSASHINO/TOKYO 180/JAPAN/; UNIV TOKYO,DEPT ELECTR ENGN,BUNKYO KU/TOKYO 113//JAPAN/
Journal: JAPANESE JOURNAL OF APPLIED PHYSICS PART 2-LETTERS, 1991, V30, N10B (OCT 15), PL1808-L1810
Language: ENGLISH Document Type: ARTICLE
Abstract: With InGaAs/InP materials, we have fabricated **gain-coupled** distributed feedback lasers having **grating** corrugation on the active layer itself, using two-step organometallic vapor phase epitaxy. Single longitudinal mode properties have been achieved. Self-consistent calculation of **coupling** **coefficients** and threshold gain difference for these lasers has also been carried out.

22/3,AB/39 (Item 1 from file: 35)
DIALOG(R)File 35:Dissertation Abs Online

01729908 AADAAI9953466
A new and efficient theoretical model to analyze chirped **grating** distributed feedback lasers
Author: Arif, Muhammad
Degree: Ph.D.
Year: 1999
Corporate Source/Institution: The University of Dayton (0327)
Source: VOLUME 61/01-B OF DISSERTATION ABSTRACTS INTERNATIONAL. PAGE 344. 117 PAGES

Threshold conditions of a distributed feedback (**DFB**) **laser** with a linearly chirped **grating** are investigated using a new and efficient method. **DFB laser** with chirped **grating** is found to have significant effects on the lasing characteristics. The coupled wave equations for these lasers are derived and solved using a power series method to obtain the threshold condition. A Newton-Raphson routine is used to solve the threshold conditions numerically to obtain threshold gain and lasing wavelengths. To prove the validity of this model, it is applied to both conventional index-coupled and complex-coupled **DFB lasers**. The threshold gain margins are calculated as functions of the ratio of the **gain coupling** to index coupling (|κ<italic>_g</italic>|/|κ<italic>_n</italic>|), and the phase difference between the index and gain gratings. It was found that for **coupling coefficient** |κ|<italic>l</italic> < 0.9, the laser shows a mode degeneracy at particular values of the ratio |κ<italic>_g</italic>|/|κ<italic>_n</italic>|, for cleaved facets. We found that at phase differences π/2 and 3π/2, between the gain and index **grating**, for an AR-coated complex-coupled laser, the laser becomes multimode and a different mode starts to lase. We also studied the effect of the facet reflectivity (both magnitude and phase) on the gain margin of a complex-coupled **DFB laser**. Although, the gain margin varies slowly with the magnitude of the facet reflectivity, it shows large variations as a function of the phase. Spatial hole burning was found to be minimum at phase difference nπ, n = 0, 1,<math> <f> &cdots;</f> </math> and maximum at phase differences π/2 and 3π/2. The single mode gain margin of an index-coupled linearly chirped CG-DFB is calculated for different chirping factors and coupling constants. We found that there is clearly an optimum chirping for which the single mode gain margin is maximum. The gain margins were calculated also for different positions of the cavity center. The effect of the facet reflectivities and their phases on the gain margin was investigated. We found the gain margin is maximum and the Spatial Hole Burning (SHB) is minimum for the cavity center at the middle of the laser cavity. Effect of chirping on the threshold gain, gain margin and spatial hole burning (SHB) for different parameters, such as the **coupling coefficients**, facet reflectivities, etc., of these lasers are studied. Single mode yield of these lasers are calculated and compared with that of a uniform **grating DFB laser**.

22/3,AB/40 (Item 2 from file: 35)
DIALOG(R)File 35:Dissertation Abs Online

01680786 AADNQ32994

MODELLING AND ANALYSIS OF **GAIN-COUPLED DFB** SEMICONDUCTOR **LASERS** (FIBER OPTICS, DISTRIBUTED FEEDBACK)

Author: CHEN, JIANYAO
Degree: PH.D.
Year: 1997
Corporate Source/Institution: ECOLE POLYTECHNIQUE, MONTREAL (CANADA) (1105)
Source: VOLUME 59/12-B OF DISSERTATION ABSTRACTS INTERNATIONAL. PAGE 6368. 179 PAGES
ISBN: 0-612-32994-1

With the unique features of compact size and a built-in frequency selective element, the distributed feedback (**DFB**) semiconductor **lasers** are presently the most promising light sources in optical fiber communications systems. The recently introduced **gain coupling** and multielectrode modulation provide new possibilities for the improvement of that laser. The aim of this dissertation is to develop a comprehensive and versatile numerical tool for the efficient and accurate simulation of those delicate devices and, through rigorous modelling and analysis, to reveal various salient features of **gain-coupled DFB lasers**.

Based on the standing wave formalism, the coupled mode method and the Green's function analysis are used in this thesis to study **gain-coupled DFB lasers**. By separating the temporal and spatial dependencies of the modal fields in the lasers, the approach possesses a unique advantage of producing simple and insightful closed form results which help gain physical understanding into the laser operation. With the help of the spatially dependent rate equations, a self-consistent, multimode, full bias range (from below to above threshold) model has been developed for complex-coupled **DFB lasers** including multielectrode modulation. The detailed analysis of this thesis covers a wide range investigation of **gain-coupled DFB laser** physics. Using the Bloch wave analysis, the condition of single mode oscillation in **gain-coupled DFB lasers** has been explained intuitively and the significant effect of unequal section lengths in the gain **grating** on the single-mode gain margin has also been revealed for the first time. Based on the spatially dependent multimode rate equations developed in this thesis, the static and dynamic characteristics of the lasing mode and of the side modes of **gain-coupled DFB lasers** are investigated in detail. The study has also been successfully extended to the analysis of multielectrode push-pull **DFB lasers** to include the modal interference effect for the first time. Through the study of the role of the complex **coupling coefficient** and the various spatial features, an in-depth understanding of the high yield, high power, high speed, high side mode suppression, low threshold, low frequency chirp, and low harmonic distortion in **gain-coupled DFB lasers** has also been reached.

01428297 AADAAI9526844
PART I: LONGITUDINAL STATIC AND DYNAMIC EFFECTS IN SEMICONDUCTOR LASERS. PART II: SPECTRAL CHARACTERISTICS OF PASSIVELY MODE-LOCKED QUANTUM WELL LASERS (CHIRP, FEMTOSECOND LASER)

Author: SCHRANS, THOMAS PIERRE
Degree: PH.D.

Year: 1994
Corporate Source/Institution: CALIFORNIA INSTITUTE OF TECHNOLOGY (0037)
Source: VOLUME 56/04-B OF DISSERTATION ABSTRACTS INTERNATIONAL.
PAGE 2230. 224 PAGES

In the first part of this thesis a static model for above threshold operation of a single mode laser, consisting of multiple active and passive sections, is developed by calculating the longitudinal optical intensity and electron density distribution in a self-consistent manner. Feedback from an index and gain **grating** is included, as well as feedback from discrete reflections at interfaces and facets. Longitudinal spatial holeburning is analyzed by including the dependence of the gain and the refractive index on the electron density. The mechanisms of spatial holeburning in quarter wave shifted **DFB lasers** are analyzed. A new laser structure with a uniform optical intensity distribution is introduced and an implementation is simulated, resulting in a large reduction of the longitudinal spatial holeburning effect.

A dynamic small-signal model is then developed by including the optical intensity and electron density distribution, as well as the dependence of the **grating coupling coefficients** on the electron density. Expressions are derived for the intensity and frequency noise spectrum, the spontaneous emission rate into the lasing mode, the linewidth enhancement factor, and the AM and FM modulation response. Different chirp components are identified in the FM response, and a new adiabatic chirp component is discovered. This new adiabatic chirp component is caused by the nonuniform longitudinal distributions, and is found to dominate at low frequencies. Distributed feedback lasers with partial **gain coupling** are analyzed, and it is shown how the dependence of the **grating coupling coefficients** on the electron density can result in an enhancement of the modulation bandwidth and a reduction in chirp.

In the second part, spectral characteristics of passively mode-locked two-section multiple quantum well laser coupled to an external cavity are studied. Broad-band wavelength tuning using an external **grating** is demonstrated for the first time in passively mode-locked semiconductor lasers. A record tuning range of 26 nm is measured, with pulse widths of typically a few picosecond and time-bandwidth products of more than 10 times the transform limit. These large time-bandwidth products are due to a strong linear upchirp, and pulse compression by a factor of 15 is demonstrated to a record low pulse widths of 320 fs.

A model for pulse propagation through a saturable medium with self-phase-modulation, due to the α-parameter, is developed for quantum well material, including the frequency dependence of the gain medium. This model is used to simulate two-section devices coupled to an external cavity. A linear upchirp is imposed on the pulse, due to a combination of self-phase-modulation in the gain section and absorption of the leading edge of the pulse in the saturable absorber.

22/3,AB/42 (Item 1 from file: 94)
DIALOG(R)File 94:JICST-EPlus

01425138 JICST ACCESSION NUMBER: 92A0108546 FILE SEGMENT: JICST-E
Analysis of **Gain-Coupled DFB Lasers** with Absorptive Gratings for Their Low Threshold Operation.
NAKANO YOSHIAKI (1); TADA KUNIO (1); CAO H L (1); INOUE TAKESHI (2); LUO Y (2)
(1) Univ. of Tokyo, Faculty of Engineering; (2) Optical Measurement Technology Development Co., Ltd.

Denshi Joho Tsushin Gakkai Gijutsu Kenkyu Hokoku(IEIC Technical Report (Institute of Electronics, Information and Communication Enginners), 1991, VOL.91,NO.402(OQE91 132-150), PAGE.19-24, FIG.4, REF.11
JOURNAL NUMBER: S0532BBG
UNIVERSAL DECIMAL CLASSIFICATION: 621.375.826:621.315.592
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication

22/3,AB/43 (Item 2 from file: 94)
DIALOG(R)File 94:JICST-EPlus

01006137 JICST ACCESSION NUMBER: 90A0166011 FILE SEGMENT: JICST-E
Gain-coupled DFB semiconductor **laser** having corrugated active layer.
LUO Y (1); NAKANO Y (1); TADA K (1); INOUE T (2); HOSOMATSU H (2); IWAOKA H (2)
(1) Univ. Tokyo, Tokyo, JPN; (2) Optical Measurement Technology Development Co. Ltd., Tokyo, JPN
Tech Dig IOOC 89, 1989, PAGE.723-724, FIG.5, REF.3
JOURNAL NUMBER: K19890583H
ISBN NO: 4-930813-33-6
UNIVERSAL DECIMAL CLASSIFICATION: 621.375.826:621.315.592
LANGUAGE: English COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Conference Proceeding
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication

22/3,AB/44 (Item 1 from file: 144)
DIALOG(R)File 144:Pascal

16146147 PASCAL No.: 03-0300353
Numerical simulation of a pulsed laser pumped distributed-feedback waveguided dye laser by coupled-wave theory
DULUO ZUO; OKI Yuji; MAEDA Mitsuo
State Key Laboratory of Laser Technology, Huazhong University of Science and Technology, Wuhan 430074, China; Graduate School of Information Science and Electrical Engineering, Kyushu University, Fukuoka 812-8581, Japan
Journal: IEEE journal of quantum electronics, 2003, 39 (5) 673-680
Language: English
A dynamic model of pulsed **laser** pumped distributed-feedback (**DFB**) waveguided dye **laser** based on a coupled-wave theory is described. Due to the periodical distribution of the intensities of pump source and stimulated emission along the waveguide, the rate equations of the population densities are turned into the equations of the Fourier **coefficients**. **Coupled**-wave equations of optical fields are used to simulate the laser oscillation. Besides the temporal evolution of the output intensity, the spectra can also be obtained by the Fourier transform of the optical fields. Two different configurations of the waveguided dye **laser**, prefabricated **DFB** (mainly index coupling), first- and second-order holographic DFB (dynamic **gain-coupling**), are considered in the model. The simulation shows that: 1) the temporal waveforms of the holographic DFB consist of sharp spikes; 2) the broadened spectral widths resulted from the possible nonuniformities in propagation constant or **grating** period are less than 50 pm except for the

second-order holographic DFB; and 3) strong parasitic oscillations can be observed in the second-order holographic DFB with terminal reflection. These results and the comparisons of some of them to the experiments are reported.

22/3,AB/45 (Item 1 from file: 350)
DIALOG(R)File 350:Derwent WPIX

016085688
WPI Acc No: 2004-243563/200423
XRPX Acc No: N04-193248
Gain knot-pattern distributed feedback type semiconductor laser for optical communication system, has diffraction **grating** in which recess is embedded by buried layer with high refractive index than cladding layer
Patent Assignee: FUJITSU LTD (FUIT)
Number of Countries: 001 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
JP 2004055797	A	20040219	JP 2002210785	A	20020719	200423	B

Priority Applications (No Type Date): JP 2002210785 A 20020719
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
JP 2004055797	A		15	H01S-005/12	

Abstract (Basic): JP 2004055797 A
Abstract (Basic):

NOVELTY - A cladding layer (3) covers the outermost surface of protrusion in diffraction **grating** (4). The recess of diffraction **grating** is embedded by a P/N type buried layer (5) with higher refractive index than the cladding layer.

USE - Gain knot-pattern distributed feed back (**DFB**) type semiconductor **laser** used as light source of optical communication system.

ADVANTAGE - Since the diffraction **grating** recess is embedded by buried layer with higher refractive index, high **gain coupling coefficient** is achieved, stable single wavelength operation of high output and big reflective return light resistance are achieved. Improves speed and efficiency of the laser.

DESCRIPTION OF DRAWING(S) - The figure shows an explanatory drawing of the Gain knot-pattern **DFB** semiconductor **laser**. (Drawing includes non-English language text).

cladding layers (1,3)
active region (2)
diffraction **grating** (4)
P/N type buried layer (5)
pp; 15 DwgNo 1/10

22/3,AB/46 (Item 2 from file: 350)
DIALOG(R)File 350:Derwent WPIX

013270569
WPI Acc No: 2000-442475/200038

XRPX Acc No: N00-330155

Gain coupled distributed feedback semiconductor laser in fiber optics communication system, has complex coupled **grating** formed on substrate by etching grooves along cavity length direction in active region

Patent Assignee: NORTEL NETWORKS LTD (NELE); NORTEL NETWORKS CORP (NELE)

Inventor: HONG J; MAKINO T

Number of Countries: 027 Number of Patents: 003

Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
WO 200036717	A1	20000622	WO 99CA1067	A	19991110	200038	B
EP 1055272	A1	20001129	EP 99973441	A	19991110	200063	
			WO 99CA1067	A	19991110		
JP 2002532907	W	20021002	WO 99CA1067	A	19991110	200279	
			JP 2000588867	A	19991110		

Priority Applications (No Type Date): US 98209977 A 19981211

Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
WO 200036717	A1	E	40	H01S-005/12	
Designated States (National): CA JP					
Designated States (Regional): AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE					
EP 1055272	A1	E		H01S-005/12	Based on patent WO 200036717
Designated States (Regional): AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI					
JP 2002532907	W		35	H01S-005/12	Based on patent WO 200036717

Abstract (Basic): WO 200036717 A1

Abstract (Basic):

NOVELTY - A high order complex coupled **grating** (18) is formed by etching several grooves which provide gain of modulation in the active region (14) along the cavity length direction, on the substrate (12). The shape of the grooves, and the order and duty cycle of the **grating** are defined to provide a predetermined ratio of gain/loss to index **coupling coefficients**.

DETAILED DESCRIPTION - The predetermined ratio of gain/loss to index coupling is defined by the depth of etching. Contact electrodes (24,26) defined on the ridge (22) and at the bottom of the substrate (12) respectively inject current into the active region (14).

An INDEPENDENT CLAIM is also included for the production of a complex coupled **DFB** semiconductor **laser**.

USE - In fiber optic communication systems.

ADVANTAGE - As the predetermined ratio of gain is provided to index coupling by forming **grating**, a **DFB laser** with high efficiency, yield, single mode operation and side mode suppression ratio is efficiently produced. The need for deep etching to obtain strong index coupling is eliminated. High order lasers can be easily manufactured because of the larger period of gratings.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic cross-sectional view of the **DFB laser**.

Substrate (12)

Active region (14)

Grating (18)

Ridge (22)

Contact electrodes (24,26)

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22/3,AB/47 (Item 1 from file: 347)
DIALOG(R)File 347:JAPIO

07080804
SEMICONDUCTOR LIGHT EMITTING ELEMENT

PUB. NO.: 2001-308451 [JP 2001308451 A]
PUBLISHED: November 02, 2001 (20011102)
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FILED: April 21, 2000 (20000421)

ABSTRACT

PROBLEM TO BE SOLVED: To realize a semiconductor light emitting element with excellent wavelength stability capable of preventing the generation of any wavelength jump even in the case of the generation of modulation in a high output or reflected return lights.

SOLUTION: In a semiconductor light emitting element in an MQW diffraction **grating** structure to be used mainly for a **gain coupling DFB laser**, the well layer of an MQW-A is made thicker than that of the well layer of an MQW-B so that the rate of a **gain coupling coefficient** to a refractivity **coupling coefficient** can be increased. The well layer and barrier layer of the MQW structure 2 are respectively constituted of GaInAsP whose compositions are different.

Query/Command : HIS

File : PLUSPAT

SS	Results	
1	1	US20030103538/PN
2	1	(1) ..FAM US20030103538/PN
3	1	..CITF US20030103538/PN
4	1	..CITB US20030103538/PN

Search statement 5

Query/Command : PRT MAX SET

1 / 1 PLUSPAT - ©QUESTEL-ORBIT - image

PN - US2003103538 A1 20030605 [US20030103538]

TI - (A1) Enhanced link operation of directly modulated lasers using gain-coupled gratings

PA - (A1) AR CARD (US)

PA0 - AR card

IN - (A1) WHITE JOHN KENTON (CA)

AP - US2586601 20011226 [2001US-0025866]

FD - Provisional: US 60334013 - 20011128 [2001US-P334013]

PR - US2586601 20011226 [2001US-0025866]
US33401301P 20011128 [2001US-P334013]

IC - (A1) H01S-003/08 H01S-005/00

EC - H01S-005/12G

PCL - ORIGINAL (O) : 372045000; CROSS-REFERENCE (X) : 372096000

DT - Basic

STG - (A1) Utility Patent Application published on or after January 2, 2001

AB - Increasing the gain-coupling of a DFB directly modulated semiconductor laser permits the output response to be overdamped without lowering the relaxation oscillation frequency of the output. The overdamping permits the laser to operate at modulation frequencies which approach the relaxation oscillation frequency with satisfactory error performance. The performance improvement is sufficient to permit operation of the laser in an uncooled environment.

UP - 2003-25

Search statement 2